Effects of Magnesium sulfate on vasogenic brain edema formation and blood-brain barrier destruction in a rat model of transient focal cerebral ischemia

Abstract

Background & obiective: Ischemic stroke as third leading cause of death and disability in the most of the human communities has complicated pathophysiology and there is no effective treatment against it.brain edema is an important complication of ischemic stroke that exacerbates primary brain injuries. Prevention of brain edema can protect the brain from further damage and improve patient,s outcome. The present study designed to evaluate the effects of treatment with magnesium sulfate on vasogenic brain edema formation, BBB integrity in a rat model of ischemic stroke.

Methods: Male Sprague-Dawley rats were divided into three main groups (n=16) , sham , control ischemic. Magnesium sulfate treated (300 mg/kg loading dose at the beginning of reperfusion time followed by a further 100 mg/kg at 20 min later) ischemic groups. Transient focal cerebal ischemia was induced by 60-min-long occlusion of the left middle cerebral artery followed by 24-h-long occlusion of the left middle cerebral artery followed by 24-h-long reperfusion. Sensorimotor dysfunctions were evaluated at the end of the reperfusion period. Measurement of the infract volumes and investigation of ischemic brain edema formation were done using TTC staining and wet/dry method respectively. Additionally, blood-brain barrier permeability was assessed by Evans blue extravasation technique.

Results: occurring of ischemic stroke in the control group produced significant brain infarction and edema in conjunction with severely impaired sensorimotor functions. Treatment with magnesium sulfate significantly reduced the infarct volume and improved sensorimotor disabilities ($p<0.01$ and $p<0.05$ respectively).Additionally, magnesium sulfate significantly lowered the water content and protected BBB integrity in the ischemic lesioned hemisphere ($p<0.001$ and $p<0.05$ respectively).

Conclusion: Post-ischemic treatment with magnesium sulfate produced protective effects against ischemic brain injury. And reduced edema formation through protecting BBB integrity.

Keywords: Stroke, vasogenic brain edema , BBB , magnesium sulfate , rat.